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ABSTRACT

The development of devices used to coin agent and instrument nouns in Hebrew was investigated among 60 children aged 3, 4, 5, 7, and 11. The prevalent word-formation device in Hebrew is the triconsonantal root combined with vowel patterns. Other available devices include suffixation, conversion, and compounding. Questions designed to elicit innovative nouns were posed to the subjects. It was found that different word-formation devices were preferred at different ages, with suffixation preferred by most subjects beyond the age of 4. The results are compared with those of a similar study of English-speaking children in order to distinguish language-specific from universal response patterns. For example, the low incidence of compounding by Hebrew-speaking children is attributable to its lack of utility in Hebrew. The more varied set of devices available to Hebrew speakers for coining nouns makes the task of acquisition more complex and prolonged than for English speakers. Children in both studies were able to coin agent nouns before instruments, relied on fewer devices for coining agent nouns, and used suffixation as the preferred device. (RW)

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The Acquisition of Agent and Instrument Noun Forms in Hebrew*

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Lexical innovation--the process of coining new words--is a common phenomenon. In English, for instance, we have heard such recent innovations as glamorama, jogathon, complexification, or Stonehengey. The devices speakers use when they coin such words are typically constrained by the word-formation options available in their language. And part of what children learn when they acquire a language is a repertoire of word-formation devices and the conditions under which they can be used, knowledge that is reflected in how children, as well as adults, coin new words.

Hebrew is of interest for the study of lexical innovation and the acquisition of word-formation devices because the word-structure of Semitic languages differs in several respects from that of Indo-European languages. As a result, a comparison of how children construct new words in English and Hebrew should allow us to distinguish general principles from language-specific patterns in the acquisition of word formation. In the present study, we examined the development in children of devices used to coin agent and instrument nouns in Hebrew, for eventual comparison with English (Clark & Hecht, 1982).

Hebrew constructs most of its content vocabulary (verbs, nouns, and adjectives) from two major elements: (1) consonantal roots, usually made up of three consonants, and (2) morphological patterns applied to the roots, that is obligatory vowel infixes with or without affixes. For example, the root z-m-r yields, among other words, the verb le-zamer 'to sing', zemer 'a song'[1], zamar 'singer', zimriya 'song-festival', while the root s-p-r yields, inter alia, le-saper 'to tell, narrate', sefer 'book'[2], and sifriya 'library'. The root g-d-l yields the verbs le-gadel 'to grow, trans. = raise', li-gdol 'to grow, intrans. = get bigger', le-hagdil 'to enlarge, make bigger', and the roots š-k-n the verbs le-šaken 'to install', li'škon 'to reside', and le-haškin 'to set, establish'. The same two roots yield nouns like migdal 'tower'/miškan 'dwelling-place', gidul 'a growth'/šikun 'housing', gdula 'greatness'/šxuna 'neighborhood', the adjective gadol 'big' (but no corresponding *šaxon), and the noun šaxen 'neighbor' (with no corresponding *gadel). Thus while there are many gaps, and no root occurs in all possible patterns, many patterns are used productively for word-formation, with a certain regularity or predictability in the form/meaning relations that result (see Polozky, 1978; Ravid, 1978).

One kind of knowledge Hebrew-speaking children need to acquire about word-structure, then, is how root consonants interlock with the different patterns to express specific meanings such as passive, causative, or reflexive in verbs (see Berman, 1980, 1982) or agent, instrument, place, or abstract state in nouns (Berman & Sagi, 1981).

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While root plus pattern combining is the most prevalent word-formation device in Hebrew, several other options are available for constructing new words, the three commonest of which are shown in Table 1.[3] The first is suffixation, as in iton 'newspaper' + -ay agentive, to give itonay 'journalist'. (The base word is sometimes slightly modified before the suffix, as in bari 'healthy' + -ut abstract noun ending, to briyut 'health'.) The second option involves no change in the form of the base: it allows present-tense forms (or beynoni) to become nouns through "conversion" or zero derivation. This is a very productive device in Hebrew for coining agent nouns but less so for instruments. For instance, the present-tense form šomer 'he watches, is guarding' also functions as a noun meaning 'a watchman, a guard'. The third option is compounding by juxtaposing two existing words to create a new lexical item, with the order head + modifier. The initial, head noun sometimes changes to a "bound" form in the process, e.g., xéder 'room' combines with šeyna 'sleeping' to form xadár šeyna 'bedroom.'

Table 1: Word-Formation Devices other than Root + Pattern

1. Suffixation - addition of suffixes to existing words:

xašmal	'electricity'	+ -ay agentive	=	xašmalay	'electrician'
tariy	'fresh'	+ -ut abstract noun	=	triyut	'freshness'
ezor	'region'	+ -iy adjectival	=	ezoriy	'regional'
kaf	'spoon'	+ -it diminutive	=	kapit	'teaspoon'

2. Conversion - use of present participial form as agent and (less often) instrument noun:

FORM	VERB	AGENT NOUN	FORM	VERB	INSTRUMENT NOUN
šofet	judges	a judge, magistrate	mocec	sucks	baby's pacifier
nivxan	takes an exam	an examinee	nispax	is-attached	appendix
me'amen	trains	a coach, trainer	mekarer	cools	refrigerator
mannig	leads, conducts	a coach, trainer a leader	maxšir	prepares, trains	instrument

3. Compounding - combination of two nouns as Head + Modifier:

xéder	'room'	+ oxel	'food'	=	xadar óxel	'dining room'
báyit	'house'	+ sefer	'book'	=	bet séfer	'school'
naaláyim	'shoes'	+ bayit	'house'	=	naaley báyit	'slippers'
beged	'garment'	+ yam	'sea'	=	beged yám	'swimsuit'

In this study, we focused on the devices children use to form new instrument nouns for picking out kinds of people and objects respectively in Hebrew. Our point of departure was an earlier study by Clark and Hecht (1982) that analyzed children's innovative agent and instrument nouns in English where the conventional, most productive device for both is the suffix -er. For example, one can add -er to the verb base hit to form hitter, for someone who hits things, or to the verb break to form breaker, for a machine used to break things.

In Hebrew, the options are more numerous, and hence more complicated. Table 2 illustrates some of the commonest options for agent and instrument nouns, and shows that (a) both categories make use of conversion, forming nouns from present participial verb forms; (b) both types of nouns are also often formed with a pattern ending in -an in the form CaCC-an (e.g., from the root š-d-x 'to match, join' the word šadxan, used as an agent 'matchmaker' and as an instrument 'stapler') as well as with the suffix -an added to an existing word; (c) agent nouns are also often formed by vowel insertion alone (e.g., the root c-l-m yields the noun calam 'photographer'); and (d) instrument nouns are often formed with a prefixal ma-, as in mavreg 'screwdriver', maclema 'camera'.

Table 2: Common Devices for Coining Agent and Instrument Nouns

	ROOT	AGENT NOUN	ROOT	INSTRUMENT NOUN
1. Present Participle:	š-m-r	šomer 'watchman'	m-c-c	mocec 'baby's pacifier'
	r-g-l	meragel 'a spy'	k-r-r	mekarer 'refrigerator'
2a. CaCC-an Pattern:	r-k-d	rakdan 'dancer'	m-z-g	mazgan 'air conditioner'
	s-x-k	saxkan 'actor'	š-d-r	šadxan 'stapler'
2b. Word + -an Suffix:	c-x-k	macxik-an 'joker'		
	b-r-?	tavru'an 'sanitary worker'		
3. Vowel Insertion:	c-y-r	cayar 'painter'	w-s-t	vasat 'regulator'
	š-l-m	šalam 'paymaster'	m-t-g	meteg 'switch'
4a. ma-CCeC Pattern:			s-r-k	masrek 'comb'
			x-š-v	maxšev 'computer'
4b. ma-CCeCa Pattern:			x-r-š	maxreša 'plough'
			m-t-r	mamtera 'sprinkler'

Some devices in Hebrew are preferred for agents, and others for instruments. Thus, in the current lexicon of Hebrew, which includes many recent coinages, use of conversion, suffixal -an, and vowel infixation seem commonest with agent nouns, while prefixal ma- is often found with instruments (and other inanimate nouns, such as place nouns).

Clark and Hecht showed that, in English, children often relied initially on simple compounds (e.g., wagon-girl, for a girl who pulls wagons), particularly for agents; for instruments, the youngest children often resorted to familiar words (e.g., knife, for something that cuts). Only later did children make consistent use of -er, and when they did, they tended to use it at first for only one of its meanings--usually the agentive one. The developmental sequence observed in the English study, Clark and Hecht argued, could be best accounted for by certain general principles that guide children's acquisition of a repertoire of word-formation devices (Clark, 1980). One aim in examining related developments in Hebrew, then, is to find out how generally such principles apply across languages that are structurally quite different.

The first of these principles is that of semantic transparency:

Known elements with one-to-one matches of meanings to forms

> are more transparent for constructing and interpreting new words than elements with one-many or many-one matches.

Children relying on this principle, we suggest, will make use of the following strategy:

> In production, to express a meaning, find a single device in your repertoire and use it with only that meaning.

This predicts that for Hebrew, those devices where the connection between meaning and form is transparent will be easier for children to learn to produce then those where the connection is less transparent. As a result, (a) Hebrew children should make use of the devices with specialized meanings to distinguish agents from instruments. (b) At the same time, Hebrew-learning children should avoid the present-tense forms since these have two competing meanings--a present tense verb or an agent/instrument noun.

The second principle is that of formal simplicity:

> Simpler forms are easier to acquire than more complex ones, where simplicity is measured by the degree of change in a form. The less a word-form changes, the simpler it is.

Children who follow this principle in production should make use of the following strategy:

> Make as few changes as possible in forming a new word from an old one.

It wasn't possible to test this principle in English, but in Hebrew the various devices for forming agent and instrument nouns differ in their formal simplicity. We therefore predicted that (a) present participle forms should be the simplest to use as agents and instruments since no change in form is needed with conversion (zero derivation); (b) forms with suffixes should be simpler than forms with stem-internal adjustments; hence the -an suffix should be acquired before the patterns with the prefix ma- (see Slobin, 1973).

The principles of semantic transparency and formal simplcity therefore make conflicting predictions about the acquisition of present participle forms (formally the simplest) versus suffixal -an forms (more transparent marking). The data should therefore allow us to find out more about how these two principles interact with each other at different stages during acquisition.

The third principle is that of productivity:

> Those word-formation devices used most often by adults in word innovations are the most productive in the language for constructing new word forms.

The attendant strategy children should rely on here is:

> Look for the commonest word-formation device that expresses the requisite meaning and add that device to your repertoire for constructing new word forms.

This principle predicts that children will acquire the most productive options in each category first. (a) For agent nouns, the suffix -an, the vowel insertion pattern CaCaC, and conversion forms appear to be fairly evenly distributed in Hebrew.[4] (b) For instruments, the ma- patterns are commonest

for more specialized words that may be unfamiliar to young children, so they may be acquired later than conversion forms and -an, which appear equally common. (c) Since neither agent nor instrument compounds are common, compound forms should appear late, if at all. If they are used, they should be more likely for instruments than for agents, since there are a number of lexicalized compounds denoting instruments in the current lexicon of Hebrew.[5]

The principle of productivity, then, conflicts with semantic transparency since it predicts that both present-tense forms and suffixal -an will be used for agents and instruments. Productivity also conflicts with formal simplicity because compounding is formally simple in Hebrew since verb-base compounds rely on a canonical order identical to the sentential one, e.g., nehag otobus (drive-bus) for 'bus-driver', or šo'ev avak (absorbs-dust) for 'vaccuum-cleaner'. The predictions are summarized in Table 3 for ease of reference.

Table 3: Summary of Predictions made by each Principle

Semantic transparency:
- (i) For agents, use the suffix -an with known roots or words.
- (ii) For instruments, use the prefix ma- for know roots.
- (iii) Avoid present-tense forms because these have competing meanings.

Formal Simplicity:
- (i) Use the simpler present-tense forms before suffixes like -an.
- (ii) Use suffixes before prefixal forms with ma-.
- (iii) Use external affixes before stem-internal changes.
- (iv) Use compounds with juxtaposition of present-tense forms and object nouns before compounds with word-level morphological changes.

Productivity:
- (i) For agents, use the suffix -an, very productive, or present-tense forms or stem-internal vowel changes, also productive.
- (ii) For instruments, use prefixal ma- patterns.

Method

To elicit innovative nouns, we used the same technique as in Clark and Hecht (1982), and posed questions designed to elicit either agent or instrument forms. The two types of questions can be roughly translated as follows for agents (with the verb to burst):

> "I've got a picture of a boy who likes to burst balloons. What could we call a boy whose job is to burst balloons?"

and for instruments (with the verb to break):

> "I've got a picture of a machine that's used to break crayons. What could we call a thing that's used to break crayons?"

For each agent and instrument instruction, there was a corresponding picture of a person or a machine carrying out the action denoted by the verb. We generally showed the children the pertinent picture only after they had responded, as a way of keeping them interested in the task, but the pictures also served as prompts when children didn't come up with any response.

Each child was given 20 different verbs, 10 for agents and 10 for instruments, selected from those commonly found in the vocabulary of three-year-olds.[6] To increase the likelihood of eliciting innovative nouns from the children, we chose activities for which there was no conventional agent or instrument noun in the language. On occasion, however, children would offer conventional words. For instance, one child said that a machine used for looking at things was a colelet 'submarine', while another said that a person who tells stories is a yaxne, a Yiddish-based word for a woman who talks all the time and likes to gossip. When children gave such words, or when they failed to give any response, we prompted them for another word and showed them the pertinent picture to convince them that their earlier response wasn't appropriate.

Sixty children took part in the study, with 12 in each of five age-groups: three-, four-, five-, seven-, and eleven-year olds. The children were all middle-class second or third generation native speakers of Hebrew living in farm communities. We also gave the same task to 12 adults, mostly college students in their mid-twenties.[7]

Results

The results are summarized in Table 4. We will consider each response type in turn, beginning with the suffix -an. We predicted that this suffix should emerge early as an agentive suffix since it is specialized for agents, is an external marker, and is productive. This suffix was first used widely at age four, when it accounted for 60% of the agent responses. Its use remained fairly constant at 60-70% for the other age groups. We also predicted that -an would be used more widely for agents than for instruments, and it was: four-year-olds, for example, used -an for instruments about 40% of the time. In addition, -an was also the preferred form for instruments at every age past three, and used by adults 50% of the time. When adults did not use -an, they made use of the ma- prefix pattern (16% of their responses; not shown in Table 4). We had predicted -an would emerge earlier than ma- patterns, but we did not expect a virtual absence of ma- forms even among the oldest children. Although the ma-CCeC pattern is the preferred normative device for coining instrument nouns (the one generally used by the Hebrew Language Academy), it may not be productive in everyday colloquial usage.

The present-tense form, with zero derivation, yielded conflicting predictions from semantic transparency and formal simplicity. Overall, as Table 4 shows, its use was relatively rare except among three-year-olds. The three-year-olds, in general, found the task difficult, and produced "don't know" as their commonest response. When they did rely on a noun, they tended to use present-tense forms, used more often for agents (38%) than for instruments (22%). We should emphasize that these responses were innovative, and not merely repetitions of the verb occurring in the experimenter's question: each verb was given in the infinitive form so use of a present participial form required certain formal changes (e.g., from lisrof 'to burn' to soref 'burn-er', or from lehafxid 'to frighten' to mafxid 'frighten-er'). For three-year-olds, then, the formally simpler present-tense form seemed to take precedence over the more transparent suffixal -an.

As predicted, compounds were fairly rare overall, although they made up

quite a large proportion of the instrument forms used by seven-year-olds (28%). These compounds were not simple juxtapositions of two nouns or of a verb and object noun, but were derived forms somewhat analogous to English compounds of the type wagon-puller.

Table 4: Percentage of Agent and Instrument Forms Produced by Each Age Group

	-an		present-tense form		compound		suppletive	
	A	I	A	I	A	I	A	I
3 years	15	12	38	22	5	5	8	34
4 years	62	42	5	5	8	8	6	24
5 years	77	36	1	1	7	17	7	34
7 years	64	35	5	10	18	28	6	18
11 years	62	56	5	7	15	16	6	7
adults	73	51	10	14	3	2	6	7

The fourth category of responses shown in Table 4 is that of suppletives, that is, familiar words used in lieu of innovative word forms for the meaning given. For instance, when asked to coin a word for an instrument lehadlik nerot 'to light candles', many children responded with the word gafrur 'match'. Such responses accounted for an average of 31% of the instrument nouns supplied by the three youngest groups, a finding similar to that for English (Clark & Hecht, 1982).

In summary, children preferred different word-formation options at different ages. The youngest children, where they gave any innovative nouns at all, relied on present-tense forms for agents and instruments. From age four on, everyone showed a strong preference for -an for agents, as predicted, and also relied heavily on -an for instruments. However, for instruments, -an competed with suppletive responses up to age five, with compounds at age seven, and with ma-CCeC for adults.

Conclusions

This study allows us to make cross-linguistic comparisons in the acquisition of word-formation devices in order to distinguish patterns of response that may be language-specific from patterns that reflect more general, perhaps universal, principles of acquisition. Some of the results are clearly due to the fact that the children were acquiring Hebrew. For instance, the rarity and late emergence of compounding (compared to very early use of this device in languages like English or German) can be attributed to the low productivity of compounding in Hebrew. And, while the general developmental trends seem similar in Hebrew and English, the more varied set of devices available to Hebrew speakers for coining agent and instrument nouns make the task of acquisition more complex, and hence more prolonged, than appears to be the case for English-speaking children.

Second, some of our results can be interpeted as reflecting children's tendency to rely on general acquisitional principles, and to apply language-specific knowledge in doing so. For instance, the principle of semantic transparency that can explain English-speaking children's preference for -er over zero derivation forms also underlies Hebrew-speaking children's preference for stem-external markers of lexical categories, and their avoidance of the highly productive Semitic device of vowel insertion. While English-speaking children must attend to the shape of words as potential stems to which suffixes can be added, Hebrew-speaking children appear to pay increasing attention to the consonantal skeleton as the semantic core, and to shape these consonants according to the stock of affixal patterns available. In both languages, children start very early to acquire some devices for constructing new words.

Third, still other results seem to reflect very general principles of acquisition, unrelated to a specific language. For instance, children in both studies were able to coin agent nouns before instruments, and relied on fewer devices for coining agents than instruments. (In both languages, children also had more recourse to conventional, already familiar words--their suppletive responses--for instruments than for agents.) The fact that a single device--suffixal -er for English and -an for Hebrew--was preferred overall for both agent and instrument nouns suggests that, across languages, speakers are attentive to a superordinate category subsuming both agents and instruments, as well as to those factors that differentiate agents from instruments formally and conceptually.

Notes

[1] Words have final stress unless shown as having main stress (′) on the penultimate syllable.

[2] For present purposes, the alternations between the stops p, b, and k, and their spirant counterparts, f, v, and, x respectively, are not relevant.

[3] These devices are used for constructing nouns and adjectives, but verbs are invariably constructed from the consonantal root assigned to one or more of the seven binyanim (verb patterns). Cf. Bolozky (1978) and Ravid (1978).

[4] Determining the relative productivity of these options is particularly complex in Hebrew. For further discussion, see Clark, Berman & Hecht (in preparation).

[5] Lexicalized agent compounds with a head noun in -man, as in English mailman, policeman, milkman, are very rare in Hebrew.

[6] The 20 verbs were also selected to meet additional criteria relevant to Hebrew-word formation processes, e.g., subdivision into verb-patterns, morphophonological properties of root consonants, and transitivity.

[7] Both children and adults also received a comprehension task (see Clark, Berman & Hecht).

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